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Nassau Gas-Light Co.'s Improved Gas Generator.

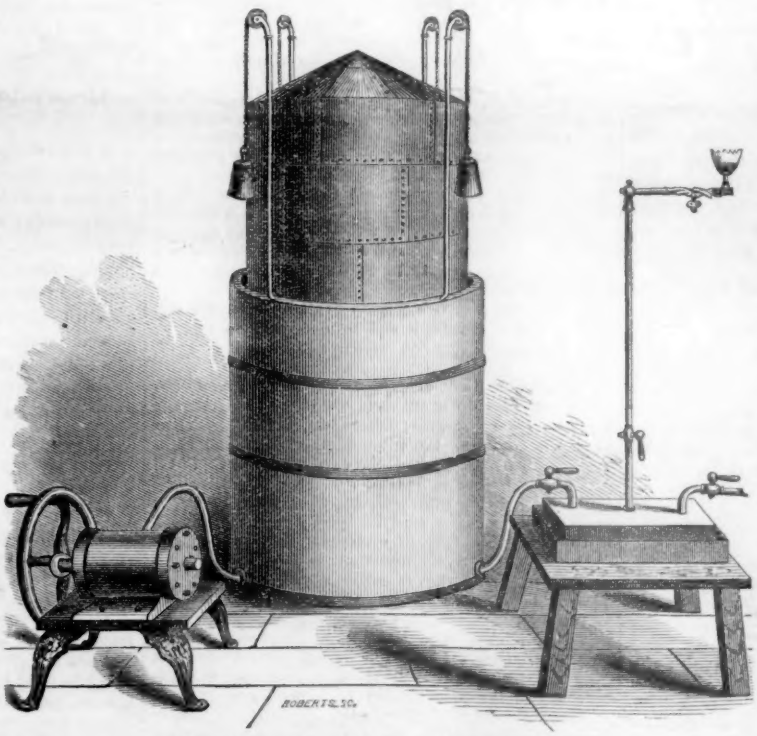
Although the ancients were far advanced in the arts and manufactures, very little attention seems to have been devoted by them to artificial light; the simple wick dipping into the oil constituted their lamps, which were most defective in principle, limited in utility, expensive in result, and often sending forth volumes of smoke, with only a small amount of light. The candle is also a scientific production of great antiquity.

The lighting of streets and dwellings by coal gas, now so generally adopted, was unknown to the *inhabitat* of a century ago. Since Mr. Murdock in 1792 first successfully employed it as a substitute for its antecedents, it has steadily advanced in favor.

Of late years a portable gas of easy and more simple production than coal gas, requiring no heat or purification, has been brought into use to a considerable extent; especially adapted for public buildings, factories, dwellings, stores, etc.

The gas is generally called "air gas," and is produced by impregnating atmospheric air with the volatile vapors of hydrocarbons derived from the distillation of coal or petroleum.

The annexed engraving represents one of the various devices employed for this purpose. The machine is constructed upon the principle of a gas-holder, as will be seen by reference to the engraving. This is simply filled with air by means of the rotary air pump at the left. The air is then forced from it by the weight of the holder into and through the carburator shown at the left, which contains the "gasoline" or its equivalent. This charges the air with carbon vapor, rendering it inflammable and capable of illumination, and like ordinary coal gas in many of its attributes.



IMPROVED GAS GENERATOR.

The advantages claimed for it by the inventor are cheapness and simplicity of the apparatus, ease of management, portability, as it can be placed in the cellar or other apartment of any building—economy of production of the gas, convenience, as it dispenses with machinery and clock work, etc. It is manufactured only as fast as it is consumed, and is distributed in the ordinary gas pipes, and is equally available in town or country. By recent improvements, it is asserted, gasoline of low gravity is used up without a residuum.

Mr. Peter Milne, one of the oldest practical gas-fitters and plumbers of Brooklyn, N. Y., is President of the Nassau Gas Co., and projector of the various improvements that have been introduced since this machine was first devised and introduced.

The company are prepared to execute orders to supply public buildings, factories, dwellings, etc., and to dispose of State, county, and town rights. For further particulars apply to the Nassau Gas Light Company, 133 Fulton street, Brooklyn, N. Y.

Coal-Gas as a Source of Ammoniacal Contamination.

In a paper on analysis of water, published at the latter end of last year in the *Scheikundige Bijdragen uit het Laboritorium van het Athenæum Illustre*, at Amsterdam, Dr. Gunning calls attention to the fact, that coal-gas, however well purified, is by no means free from ammonia; he felt induced to institute some experiments on this subject, the result of which is, that last summer the gas used in the Laboratory at Amsterdam contained 0·00075 gramme of ammonia, or ammoniacal substances in 1 litre of illuminating gas, amounts in bulk to a little over one cubic foot thereof in one thousand cubic feet of gas. Attention is called to the fact, that where wet gas meters are in use, the water of which is never replenished unless by some accident, this water must become pretty fairly saturated with ammonia; on emptying the water from one of the meters at the Laboratory at Amsterdam, its bulk was found to amount to 219 litres, *i.e.*, 48·66 gallons. Ten cubic centimeters of this fluid yielded 192 mlgrm. ammonia, or bases of a similar nature. The whole quantity of water contained, therefore, no less than 4·2 kilogs. of these bases; the meter had been in use for only two years. Since coal-gas, moreover, always contains sulphur compounds, there is formed sulphate of ammonia, which, on becoming converted by the intense heat into bisulphate of ammonia, attacks the glass cylinders, or chimney, placed on the Argand gas burners. Dr. Gunning has found from expressly instituted experiments that no combustion of the ammonia takes place, not even in Bunsen burners, and mentions that a platinum basin filled with pure water and placed for even less than an hour over a Bunsen burner, had got contaminated with a perceptible quantity of ammonia in the form of sulphate. There are two companies supplying gas to Amsterdam, and there is a strong competition, but also a good surveillance to secure the gas to be as pure as possible. The experiment above alluded to was made with gas taken directly from the street main.—*Chemical News.*

A Remarkable Gas Well.

The *Scientific American* says: Mr. F. Bowen, writing to us from Burning Springs, W. Va., gives the following description of a wonderful well, emitting gas at high pressure. He says: "I will attempt to give you some idea of an immense gas vein here, which may be interesting to you and your readers. The well is 900 feet deep, four inch bore with a two inch pipe leading from it, more than a mile long supplying 28 boilers of 12 horse-power each, 50 stoves and many lights, beside those which spring from leaks along the line, in consequence of the great pressure. I am now writing before a brilliant light on the counter, an engine of one horse-power pumping water over the house, and the waste gas running two stoves. My gas is brought through one half and three quarters inch pipe and yet I am obliged to cut it off outside to produce the proper pressure. I believe the pressure is not less than 200 pounds to the square inch. The gas is nearly pure hydrogen with some carbon; it soon, however, mixes with the atmospheric air and thus becomes illuminating."

—The Pennsylvania steel works, at Baldwin, near Harrisburg, are now making four heats or about fifteen tons of Bessemer steel per day, and give employment to one hundred hands.

Versmann's Report on the Bi-sulphide of Carbon.

The usual way of determining the sulphur of the bi-sulphide of carbon, is to burn the gas, thereby producing sulphurous acid, which is collected, converted into sulphuric acid, and then estimated as sulphate of barytes. The only difficulty in this process is the complete absorption of the sulphurous acid, which was secured by the following asrangement:

A small air and gas-burner was placed inside a very spacious glass retort open at the bottom and afterwards closed by dilute ammonia, contained in a suitable glass vessel. The retort was then connected with two Woolf's bottles, the first of which contained a solution of ammonia, and the second a solution of iodine in iodide of potassium; the gaseous products of combustion were forced through these liquids by means of strong air-currents produced by a water-aspirator, and thus absorbed.

The solution of iodine was used merely is case some of the sulphurous acid should escape unabsorbed by the ammonia; but it was found, in all these experiments, that not a trace of it could be detected in the second bottle.

The sulphurous acid, combined with the ammonia to sulphite of ammonia, was then converted into sulphuric acid by a solution of iodine in iodide of potassium, precipitated by chloride of barium, and weighed as sulphate of barytes.

This apparatus was connected with the neck of the retort; but, a similar one was in communication with the body of the retort, by means of a glass tube passing through the dilute ammonia into the body of the retorts. In order to be sure of a constant pressure of the gas, and thus allowing the operation to go on safely for a length of time, a small, delicate regulator was placed between the experimental meter and the burner, by which arrangement a certain maximum of pressure could not be exceeded; this was the more requisite because the variation in pressure in the experiments made at the works was necessarily very considerable; and without this regulator, the combustion might take place too quickly, the resulting carbonic a id not being drawn off in the same ratio, might ultimately extinguish the flame.

Mr. Versmann then gives the results of experiments extending over 629 hours, or upwards of 26 days, and made upon 336 feet of the Commercial Company's gas, in which the average grains of free sulphur found in each 100 cubic feet of gas was 2.99. In other short experiments, burning only 5½ cubic feet of gas, the average was 6.35 grains per 100 cubic feet. Like experiments upon the Chartered Company's gas gave an average of 9.41 grains.

Mr. Versmann then goes on to say that—

The variation in these results appears, at first sight, considerable, and it may be difficult to find a precise explanation; but the subsequent calculations will show that even the largest quantity is comparatively so small that the difference becomes very insignificant indeed.

The formation of bi-sulphide of carbon greatly depends upon—1st. The dampness of the coals, because in very damp coals all sulphur will most probably be converted into sulphuretted hydrogen; 2ndly. The degree of heat to which the coals are exposed; and 3rdly. Upon the quantity of sulphur present in the coals.

It is evident, therefore, that experiments made at various times, and made with gas of different works must lead to somewhat different results; and I think that the uniformity in these experiments is by far greater than could have been anticipated.

In proceeding to the practical view of the question, *i. e.*, whether this amount of sulphur may possibly become in any way injurious or obnoxious to persons inhaling the atmosphere of places where the gas is burnt, we must enter the dry field of calculation. Numbers always speak for themselves, and are at least open to contradiction.

100 cubic feet of gas are found to contain 1.99 grains, 6.85 grains, and 9.41 grains of sulphur as bi-sulphide of carbon.

The specific gravity of your gas is equal to 0.440, and I will assume the gas of the Chartered Gas Co. to be of the same specific gravity. 100 cubic feet of air weigh 56,490 grains, and consequently 100 cubic feet of gas weigh 56,490 grains x 0.440 = 24,856 grains, which contain 2.99 grains, 6.53 grains and 9.31 grains of sulphur respectively, corresponding to 0.012, 0.026, and 0.38 per cent. by weight of sulphur, or 10,000 parts by weight of gas contain 1.2, 1.6, and 3.8 parts by weight of sulphur respectively. Or, if we compare the relative proportions by volume, we arrive at even smaller numbers, in consequence of the specific gravity of the bi-sulphide of carbon vapors being considerably high, viz., 2.66. I speak here of the vapors of bi-sulphide of carbon, and not of that of sulphur, because it will be more correct to compare the volume of the gas with the volume of the first vapor. The sulphur vapors have so high a specific gravity as 6.65; the calculation shows that one volume of bi-sulphide of carbon consists of half a volume of carbon vapors, and one-third of a volume of sulphur vapors.

The above quantities of sulphur, 2.99 grains, 6.35 grains, and 9.41 grains, correspond to 3.55 grains, 7.22 grains, and 11.22 grains of bi sulphide of carbon.

As 100 cubic feet of air weigh 56,490 grains, 100 cubic feet of vapor of bi-sulphide of carbon weigh 56,490 grains x 2.66 = 150,263 grains; and again, if 150,263 grains have a volume of 100 cubic feet, 3.55 grains, 7.22 grains, and 11.42 grains have a volume of 0.00236, 0.00480, and 0.00747 cubic feet, these fractions of cubic feet of bi-sulphide of carbon vapors are contained in 100 cubic feet of gas; or, in other words, 10,000 cubic feet of gas contain 0.236, 0.480, or 0.747 cubic feet respectively of vapors of bi-sulphide of carbon.

The result of these experiments, then, is that the gas contains in 10,000 parts by weight 1.2, 2.6, and 3.8 parts of sulphur, and 10,000 parts by volume, 0.236, 0.480, and 0.747 parts of bi sulphide of carbon; and it may, without hesitation, be affirmed that such a small quantity cannot have the slightest injurious effect, and that, even if the quantity was much larger, it would nevertheless be innocuous.

To give you a still more convincing demonstration of the infinite smallness of these numbers, I will now compare the products of combustion of gas; and here again I shall be supported by the indisputable authority of calculation.

The principal product of combustion of gas, besides water, is carbonic acid, a gas which does not sustain animal life, being, on the contrary, injurious if inhaled in an excessive quantity.

It will, therefore, be interesting to find the relative proportions of carbonic and sulphurous acid, formed by combustion of a certain quantity of gas.

In calculating the quantity of carbonic acid produced in burning gas, we find that 100 volumes form about 30 volumes of carbonic acid. The olefiant gas yields twice its volume, and light carburetted hydrogen its own volume of carbonic acid; assuming the gas to contain in 100 volumes at the average 5 volumes of the former, and 40 volumes of the latter, this would give 50 volumes of carbonic acid, which certainly is below the actual result.

The bi-sulphide of carbon, in being burnt, produces su phurous acid, a gas which is destructive, if present any sensible quantity, and which it would certainly be very desirable to banish altogether by some practical means.

In forming sulphurous acid the sulphur combines with two equivalents, or exactly its own weight of oxygen, yielding twice its weight of acid, so that the 2.99 grains, 6.35 grains, and 9.41 grains of sulphur will produce 5.98 grains, 12.70 grains, and 18.82 grains of sulphurous acid.

In order to compare these quantities with the volume of carbonic acid, it will be necessary to remark that the specific gravity of sulphurous acid is 2.247, and thus to make a calculation as before.

As 100 cubic feet of acid weigh 56,490 grains, 100 cubic feet of sulphurous acid weigh 56,490 grains, x 2.247 = 126,933 grains; and again, if 126,933 grains have a volume of 100 cubic feet, 5.98 grains, 12.70 grains, and 18.82 grains have a volume of 0.0047, 0.0100, and 0.0148 cubic feet.

These numbers represent, together with about 50 cubic feet of carbonic acid, the products of combustion of 100 cubic feet of gas, or, comparing these proportions in larger numbers, we find that, in burning gas, with every 50,000 cubic feet of carbonic acid, 4.7, 10.12, and 14.8 cubic feet of sulphurous acid are formed, and distributed into the atmosphere.

The sulphurous acid has certainly far more destructive properties than carbonic acid, although the last does not support combustion or animal life; but it is quite out of the question that these small quantities of sulphurous acid could have any injurious effect upon the human constitution, while the enormous quantities of carbonic acid formed at the same time should have no effect whatever.

I am of opinion that, before any person could be inconvenienced by these quantities of sulphurous acid, he must have ceased to live, long previously, from the effect of carbonic acid.

The fact is, in examining this question, it has generally been neglected to make proper allowance for this circumstance, that all our houses and rooms are so well and constantly ventilated that any dangerous accumulation of gases cannot easily take place.

It would, indeed, be highly desirable to remove even these traces of bi-sulphide of carbon from the gas, because we naturally wish to have as few impurities as possible in the atmosphere, and we are quite justified in doing our utmost to get rid of them; but I very much question whether the removal of bi-sulphide of carbon from the gas would be the first and most important point, if we were seriously bent upon ameliorating the atmosphere of our houses, especially in large towns.

I think far too much importance has been given to this subject, most likely from no extensive experiments having been made, or proper comparison drawn with other causes tending to impair the state of our atmosphere.

Before concluding these remarks I will subjoin a parallel example, which I trust will be as convincing as the former statements. It is well known that our common lucifers are prepared by dipping pieces of wood into melted sulphur, and afterwards into a chem cal composition, which upon frictson produces ignition. It is somewhat surprising that this branch of industry is almost in a state of infancy in England, when we consider its progress elsewhere; and I have often found that the lucifers in use here contain two or three times as much sulphur as is required, and even more.

No one can imagine that any serious injury or deterioration of the state of the atmosphere can take place from lighting a lucifer in a room, and yet, when we come to compare the amount of sulphurous acid thus produced with that resulting from burning a certain quantity of gas, we shall soon find that the danger is in one case as great as in the other.

I determined, with this view the quantity of sulphur adhering to a variety of lucifers, taking twelve lucifers, converting the sulphur into sulphuric acid, and determining this as sulphate of barytes. I hereby arrived at the result that a great variety of lucifers have more than one grain of sulphur a piece.

We may assume that a large lofty room is lighted with four gas burners, each consuming five cubic feet of gas per hour, and that their flames burn for 5 hours, in order to consume 100 cubic feet of gas, containing 2.99 grains, 6.35 grains, and 9.41 grains of sulphur.

The same quantity of sulphur would be burnt by lighting during the five hours three, seven, or ten lucifers; and I really do not think that any one could entertain the slightest fear in so doing, although the phosphoric acid simultaneously produced may be, perhaps, even more in quantity than the sulphurous acid. I am sure that this one instance will suffice to illustrate how unfounded is the apprehension of injury from the effect of the sulphurous acid; and I must say that the quantity of sulphur found in these experiments must be much larger before any reasonable fear could be entertained.

Absorption of Light by Different Bodies.

It is a well-known fact that a colored body, such as red glass, absorbs one kind of light more than another; but even when bodies are apparently of the same color their power of absorbing certain rays of light may be very different. In order, therefore, to analyze completely the relation of a substance to light, a pure spectrum must be formed by means of a narrow luminous slit lighted up by the sun, or by the electric light, and the substance to be examined must be held in front of the slit; in this way certain rays will either be entirely wanting in the spectrum or at least will be partially stopped, being absorbed by the substance in front of the slit.

The following example will serve to show that bodies very similar in color have nevertheless a very different selective absorption for certain rays of light. Port wine and blood are two fluids very similar in appearance, but the former merely causes a general absorption of the more refrangible rays of the spectrum, while the latter produces two dark bands in the yellow and green. These bands were first observed by Hoppe. Professor Stokes has chosen this very example in order to show the value of selective absorption for light as a discriminating test of the presence of certain substances. He remarks that the coloring matter of blood contains a large quantity of iron, and that it might therefore be supposed that the color is due to some salt of iron, more especially as some salts of the peroxide of iron have a blood-red color. But there is found to exist a strong general resemblance, or family likeness, between salts of the same metallic oxide as regards the character of their absorption. Now none of the salts of iron give absorptive lines at all similar to those of blood, and Professor Stokes remarks that the assemblage of the facts with which we are acquainted seems to show that the coloring matter of blood is some complex compound of the five elements, oxygen, hydrogen, carbon, nitrogen, and iron. This example is sufficient to show the great importance of absorption as an auxiliary in chemical analysis. But in examining the selective absorption of bodies it is not necessary to have a solution. Thus, for example, if a spectrum be thrown upon a screen of paper painted with blood, the same dark bands are seen in the yellow and green as when the light is transmitted through a solution of blood. We thus see that the color of a paper screen so painted is

really caused by absorption, even although the paper is viewed by reflected light, and that it is not in reflection that the preferential selection for certain rays is generally made. The light, in fact, which is irregularly reflected from such a surface of paper has first of all to pass through a film of blood, and it is in this passage that the selective absorption is accomplished which produces the red color.

There are, however, some very curious exceptions to this rule. Gold, for instance, reflects yellow light most abundantly, while a very thin leaf of gold transmits blue and green but absorbs yellow. Haidinger was the first to notice this fact in a general way, which he expressed by saying that the reflected and transmitted light from gold are complementary to each other. Professor Stokes was, however, the first to examine the subject in a complete manner. The substance he used was permanganate of potash. Crystals of this substance have a metallic appearance and reflect a greenish light. When this green reflected light is analyzed by the prism, bright bands are observed, denoting a maximum of reflecting power; and these bright bands correspond in position to dark bands in the light transmitted by a solution of the same crystal.

This is an exceedingly remarkable phenomenon, and it is the more interesting as it appears to be entirely confined to metallic and quasi-metallic bodies. There are yet other peculiarities exhibited by bodies in their action upon different rays.—*Stewart's Elementary Treatise on Heat.*

On the Relation Between the Specific Gravity and Pressure of Gas.

Dr. Fyfe has observed that there are certain constant relations between the *specific gravity* of a gas (that is, its goodness) and the *pressure* at which it is burnt, and the time required to consume it—that is, provided we use a jet of a given size, and take care that the flame is of a given height. The jet which he prefers, is one having a hole the fortieth of an inch in diameter, and the height of the flame should be five inches. These relations are as follow: First, The consumption of gas in a given time, is as the square root of the pressure, and consequently the time required for the consumption of equal volumes, is inversely as the square root of the pressures. Second, The specific gravity of the gas is also inversely as the square root of the pressures. So that, if we determine by experiment what time it takes for a given volume of gas, of known specific gravity, to burn from a jet of the given size, with a flame of the given height, we are then in a condition to tell the specific gravity, or rate of consumption, of any other gas, provided it be burnt under the same circumstances, and we observe the pressure. This will be manifest from the following table:

Pressure in inches of water.	Consumption per hour.	Specific gravity.
0.6	0.67	.841
0.7	0.72	.770
0.8	0.77	.729
0.9	0.81	.687
1.0	0.86	.652
1.1	0.90	.622
1.2	0.94	.595
1.3	0.98	.572
1.4	1.02	.551
1.5	1.05	.532
1.6	1.09	.515
1.7	1.12	.500
1.8	1.15	.486
1.9	1.18	.472
2.0	1.21	.461

By means of this table we are able to determine the rate at which gas is burning, or its specific gravity, by merely observing the pressure which is necessary to obtain a flame of the given height. In conducting the experiment, the pressure-guage must of course be on the jet side of the tap. Dr. Fyfe suggests that we may, by operating in this manner, do away with the necessity for a meter, or photometer, or both, and that we may arrive at results which are approximately correct. Of course it must be understood that the gas is of the usual quality, free from carbonic acid and atmospheric air.—*Orr's Circle of the Sciences.*

—A Philadelphia gas pipe lately leaked into the sewers and took fire while workmen were repairing the leak, and exploded. The concussion is said to have jarred the buildings for many squares distance, and in street after street the heavy iron caps to the sewers were thrown high into the air. A similar, though not so serious an accident occurred recently in Brooklyn.

Temperature of Furnaces.

With reference to the heat which it is proper to employ in the distillation of coal for gas-making, it is unfortunate that science has not yet furnished the practical man with any convenient method of estimating high temperatures. Wedgwood's pyrometer, though extremely ingenious, gives all its indications on so small a base line as to require an accuracy and homogenity in the composition of the clay cylinders employed which is physically impossible. The range of temperature indicated by the Wedgwood pyrometer being more than ten times greater than the range from the freezing to the boiling point of water, has to be expressed within the limits of only nine-fifths of an inch, this being the extent to which a cylinder of clay contracts between a faint red heat at about 950° Fahr. and the melting point of cast iron at 2800° Fahr. It is true this very small range of nine-fifths of an inch, divided as it is into 240 parts, is made appreciable by Wedgwood's contrivance of reading off on a base or ruler about two feet long, but the delicacy of observing and manipulating with such an instrument is too great to render it available for practical purposes, besides which the cones or cylinders of clay can never be procured sufficiently uniform in structure.

Daniell's pyrometer is, perhaps, superior to any other that has been tried. Its indications are caused by the expansion or contraction of a bar of platinum connected with a lever which acts as an index. The dial on which the index revolves affords room for a greatly increased space to read off the results, but this instrument for practical use is liable to some of the objections against Wedgwood's pyrometer. The recent methods pointed out by Mr. Prinsey for determining high pressures by means of fusing the metals and their alloys, is far too troublesome and complicated for practical use. The beautiful experiment of obtaining the temperature of a furnace by means of thermo-electric currents is also far too delicate for ordinary use, until some contrivance more capable of being reduced to daily practice shall be introduced into gas-making, we must be content to be guided in a great measure by the colors presented by the interior of the furnace. Constant observation will, indeed, greatly improve the faculty of estimating high heats by the shades of color which they present and at all events enable the observer to compare and adjust the working of his furnaces. The following table of high temperatures, expressed in the colors commonly used, with their corresponding temperatures reduced to Fahrenheit's scale, has been principally compiled from M. Becquerel's "Traité de Physique":

	Deg. Fahr.
Faint red	960
Dull red	1290
Brilliant red (color of red oxide of lead)	1470
Cherry red	1650
Bright cherry red	1830
Dull orange	2010
Bright orange	2190
White heat	2370
Bright white	2550
Brilliant white	1730
Melting point of cast iron	2786
Greatest heat of iron blast furnace	3300

There are, however, difficulties in appreciating the various degrees of heat by color; for instance when heated retorts are exposed to the direct action of daylight, the color or temperature appears lower than it really is; or when they are inclosed in a dark locality, on the contrary, the temperature seems to be higher than reality. The means of judging the various degrees of temperature by sight is only acquired by continual practice.

The technical name applied to the temperature of retorts is "heat" or "heats"; thus it is expressed "a good heat," "a low heat," or "the heats were down," "the heats were up," etc., terms sufficiently significant to require no explanation.—*Hughes Treatise on Gas Works.*

New Test for Alkalies.—Mr. Bœtiger has discovered a reaction of great sensitiveness for alkalies and and alkaline earths. He finds an alcoholic extract of the leaves of the ornamental plant known as *Coleus Verschaffelti*, possesses the property of becoming green under the influence of alkalies. To prepare this reagent, the fresh leaves are agitated with absolute alcohol mixed with a few drops of sulphuric acid, and left digesting for 24 hours. Paper soaked in the tincture becomes red, and strips of this paper are the media of applying the test. This reagent is not influenced by carbonic acid, so that the earthy carbonates contained in water may be detected with it. The sensitiveness of the reagent is so great that a strip of the test-paper presented to a jet of coal gas speedily becomes green from the presence of ammonia.—*Druggists' Circular.*

Specific Heat of Gases.

The following facts were determined by Regnault's experiments:

1. The specific heat of a given weight of a gas which is approximately perfect, and which therefore follows the gaseous laws does not vary with the temperature of the gas.

2. The specific heat of a given weight of such a gas does not vary with the pressure or density of the gas, and hence the specific heat of a given volume of such a gas varies as its density.

3. The specific heats of equal volumes of the simple and incondensible gas are equal, but this quality does not hold for gases easily condensed, such as chlorine and bromine. It holds, however, for compound gases which are formed without condensation, such as hydrochloric acid, and nitric oxide.

4. These laws do not hold for condensible gases—the specific heat of carbonic acid gas, for instance, increases with the temperature.

The following table is derived from Regnault's determinations:

Specific Heat of Gases and Vapors Under Constant Pressure.

Gas or Vapor.	Equal. Vols.	Equal. Weights.
Air	0.2375	....
Oxygen	0.2405	0.2175
Nitrogen	0.2368	0.2438
Hydrogen	0.2359	3.4090
Chlorine	0.2964	0.1210
Bromine	0.3040	0.0555
Nitrous oxide	0.3447	0.2262
Nitric oxide	0.2406	0.2317
Carbonic oxide	0.2370	0.2450
Carbonic acid	0 3307	0.2169
Bisulphide of carbon	0 4122	0.1569
Ammonia	0.2496	0.5084
Marsh gas	0.3277	0.5929
Olefiant gas	0.4160	0.4040
Chloride of arsenic	0.7034	0.1122
Chloride of silicon	0 7778	0.1322
Perchloride of titanium	0.8564	0.1290
Perchloride of tin	0.8416	0.0939
Sulphurous anhydride	0.3414	0.1554
Hydrochloric acid	0.2333	0.1852
Sulphuretted hydrogen	0.2857	0.2432
Water	0.2989	0.4805
Alcohol	0.7171	0.4534
Wood spirit	0.5063	0.4580
Ether	1.2266	0.4797
Chloride of ethyl	0.6096	0.2738
Bromide of ethyl	0.7026	0.1896
Sulphide of ethyl	1.2466	0 4008
Cyanide of ethyl	0.8290	0 4261
Chloroform	0 6461	0.1567
Dutch liquid	0.7836	0.2293
Acetic ether	1.2184	0.4008
Benzole	1.0114	0.3754
Acetone	0 8264	0.4125
Oil of turpentine	2.3776	0.5061
Terchloride of phosphorus	0.6395	0.1347

In the first column of this table the common volume is that occupied by one pound of air, while in the second column the common weight is one pound. Also the specific heat of one pound of liquid water is taken as the unit so that the heat required to raise a pound of atmospheric air one degree under constant pressure is only 0.2375 of that required to raise a pound of water one degree.—*Stewart's Elementary Treatise on Heat.*

New, Wonderful and Practical.—The street Gas-Lighting Machines by Electricity, to be seen at No. 7 Duane street, are really wonderful, and we see no reason why they should not be generally adopted by all the cities using gas for lighting, on the points of economy and convenience. It is a simple, small machine placed in each lamp-post and connected by insulated wires with a central point, where the operator can, by simply starting the clock work attached to the batteries, at once open the cocks in each lamp and light up a whole city in the twinkle of an eye, or put out the lights at his pleasure. We notice by our Mayor's late inaugural address, that $38,000 is the estimate for labor and lighting of the city street lights. The labor and the amount of gas that would be saved in the time allowed for lighting and putting out, and the amount that is now used on bright moonlight nights, constitute an aggregate that no doubt would more than pay for the whole expense of introducing the improvement for the first year. The experiments at Duane street are worth witnessing by all.—*N. Y. Times.*

Cincinnati Gas Question.

AN ORDINANCE

TO PROVIDE FOR LIGHTING THE CITY OF CINCINNATI WITH GAS.

I. SECTION 1. *Be it ordained by the City Council of the City of Cincinnati*, That James F. Conover, his associates, their heirs, assigns and successors shall be and are hereby vested with the full and exclusive privilege of using the streets, lanes, commons and alleys of said city of Cincinnati, in the State of Ohio, for the purpose of conveying gas to the said city and citizens thereof, for the term of twenty-five years from the date hereof, and thereafter until the same shall be purchased by the City Council of Cincinnati as hereinafter provided, and shall have full and exclusive power and authority to open and use the streets, lanes, commons, and alleys of said city, for the introduction of pipes and other apparatus for gas; *Provided*, that the passage of the streets, lanes, commons, and alleys is repaired to the sati-faction of the city council within a reasonable time: *and provided, also*, that the said streets, lanes, commons and alleys are not at any time unnecessarily obstructed.

II. SEC. 2. That in consideration of the privileges hereby granted to the said Conover, his associates, their heirs, assigns, or successors, they, the said Conover, his associates, their heirs, assigns, or successors, shall furnish to the city, on the several streets, lanes, commons and alleys, in which the leading or main pipes for supplying the citizens with gas-light shall be laid and in use, such quantity of gas as may be required by the city council for public lamps, at two-thirds of the lowest average price at which gas shall or may be furnished to private individuals in the cities of New Orleans, Baltimore, New York, Louisville, and Pittsburgh; the lamp-posts, connecting pipes, meter and lamps being furnished by and at the expense of the said city.

III. SEC. 3. That said Conover, his associates, their heirs and assigns, and successors, shall bona fide commence the said gas-works, and expend thereon the sum of two thousand dollars within six months from this date, and shall have laid within two years from the date of this ordinance, six thousand feet of leading pipe for gas, and shall lay annually afterward four thousand feet of leading pipe for gas, until the principal parts of the city shall be furnished with pipes. And if the city council should be desirous of erecting lamps at the engine houses, or other public buildings or bridges belonging to the city, and the said Conover, his associates, their heirs, assigns, or successors, should refuse, for a reasonable compensation, to extend the gas-pipes to such situation or part of the city, the city shall then have the privilege of extending the same, and provide such number of lamps for the purpose aforesaid as they shall deem necessary; and the said lamps shall be furnished with gas by the said Conover, his associates, their heirs, assigns, or successors, at a price not to exceed two-thirds of the lowest average price at which gas shall or may be furnished to private individuals as aforesaid; and the said lamps shall be subject to the same regulations as other public gas lamps; and the gas-pipes laid down at the expense of the city shall not directly or indirectly be used for furnishing gas to the individual citizens, nor shall other gas-pipes be laid down within the portions of the streets, lanes commons and alleys occupied by the pipes of the city, until the whole amount expended for laying down the same be refunded by the said Conover, his associates, their heirs, assigns, or successors.

IV. SEC. 4. That the said Conover, his associates their heirs, assigns and successors, may, for all willful and intentional injuries done by individuals to their fixtures, or apparatus, recover at law from such individuals doing said damage or injury, double the amount necessary to repair the damage or injury so done, to be recovered as other debts of like amount.

V. SEC. 5. That the privileges hereby granted shall not be forfeited by any temporary failures on the part of the said Conover, his associates, their heirs, assigns, or successors, to perform any of the conditions from them exacted (except at the commencement of the said works), where such failures are occasioned by accident, untoward events, or the want of necessary repairs in machinery or apparatus of said gas-works: *Provided*, such accidents and events be remedied, and such repairs made within a reasonable time.

VI. SEC. 6. That at any time after the expiration of the said twenty-five years, the said city council shall have the right and privilege of purchasing from the said Conover, his associates, their heirs, assigns or successors, their pipes, buildings, fixtures and other apparatus owned and used by them in and about providing the city and citizens with gas, at a fair price and compensation. And the said price and compensation shall be ascertained and determined by five disinterested persons, two of whom shall be selected by the city council, and two by the said Conover, his associates, their heirs, assigns or successors, and the fifth by the four thus selected or chosen.

VII. SEC. 7. That all ordinances or parts of ordinances heretofore passed by the said city council on the subject of gas, are hereby repealed and annulled; and all privileges heretofore conferred by said council, inconsistent and incompatible with those conferred by this ordinance, are hereby rescinded and revoked.

This ordinance to take effect and be in force from and after its passage.

Passed June 16th, 1841.

ESTABLISHED VALIDITY OF THE GAS CO.'S CONTRACT WITH THE CITY OF CINCINNATI.

BY DECISION OF THE SUPREME COURT OF THE STATE OF OHIO.

HAMILTON COUNTY DISTRICT COURT.

DECISION UPON THE CONTRACT WITH THE GAS-LIGHT AND COKE COMPANY.

State of Ohio on the relation of S. M. Hart vs. The Cincinnati Gas Light and Coke Company.—The opinion of the Court was delivered by Judge Brinkerhoff.

An information in the nature of a *quo warranto* was filed in this Court with a view to the ouster of the Gas Light and Coke Company from its privileges and franchises. The information sets up the existence of this company as a corporate body, under a special act of incorporation; and that by an act subsequently passed the City Council of Cincinnati, was authorized and empowered to fix the price of gas—that furnished to individuals as well as to the public authorities; and that an ordinance was accordingly passed by Council, fixing the maximum price at $2 25 per thousand cubic feet; that the company refused to furnish gas at that rate, and exacted $2 50, in violation of the terms of the ordinance; thereby, under the provisions of the statute, passed at the same time, (but not embraced in the charter), forfeiting their franchises. To enforce this forfeiture this relation was filed.

The defendants by way of plea, set up that in persuance of the 3d section of the city charter of 1839, the City Council, on the 16th of June, 1841, passed an ordinance to provide for the lighting of the city with gas, by the terms of which, J. F. Conover, his associates, their heirs and assigns, were granted the exclusive privilege—providing that the maximum rate at which gas should be furnished to the city proper should be two thirds the average price at which it was furnished to individuals in five different cities, which were specified.

To this plea there was a demurrer, and the main question presented was whether or not by the terms of the city charter, at the time the ordinance (constituting as it does a contract between the city and Conover) was passed, the Council had the power to make and enter into such a contract. The opinion delivered by Judge Hart, late City Solicitor, at the request of the Council, was relied on solely as the argument of the relator. That opinion was to the effect that the City Council had not the power to make the contract.

The extent of the powers granted to the Council by the 3d section of the charter, was the question to be determined. The grant of power is general in its terms, and is not restrictive as to means and instrumentalities, and the Court was well satisfied that under the terms of this section of the charter, the Council had unlimited discretion—not, of course, abusing it so grossly as to invalidate it—to secure the lighting of the city by gas or with oil, by contract or otherwise. Where a general power is granted to a corporate body, without prescribing or limiting the means by which that power is called into execution, the general construction is that all usual and necessary powers are implied; and the Court was of opinion that by necessary implication from the terms of this 3d section of the charter, the Council might contract with any persons for the lighting of the city with gas. They contracted with Conover & Co. and their successors, and the privileges thus granted were assigned to the Gas-Light and Coke Co., whose term has yet some time to run

It is claimed, however, that by a subsequent act of the Legislature, a power was granted to Council to prescribe the prices of gas, and that by necessary implication, this operated as an amendment of the company's charter.

The Court did not think that would alter the question. If there was power at the time to make the contract, a subsequent alteration of the charter would not invalidate or rescind it. This could only apply to subsequent contracts; but contracts under which rights had already vested, were secured under the constitutions both of the nation and the State, and could not be impaired either by the action of the City Council or of the Legislature.

The demurrer to the plea should, therefore, be overruled.

May, 1859.

Weight of Gas Produced from Coal.

In considering the quantity of gas produced from a ton of coal, the real value is determined by its volume and its specific gravity, so that the most convenient mode of expressing the quantity is to give the weight of the gas produced, this being a compound of the quantity and the specific gravity. The latter being known, the following rule will give the weight of any quantity.

Rule—Multiply the quantity in feet by the specific gravity, and strike off the three right hand figures, then multiply the remainder by the decimal .0753, then strike off the proper decimals, and the remainder is the weight in pounds. Thus, if 100 lbs. of coal give 400 cubic feet of gas, of specific gravity 420—then 420 x 400 x .0753 = 12.65 lbs. of gas.

The following comparison of the specific gravity of gas, with the illuminating power as shown by candles, is an average deduced from the results of the best experimenters:

No. of candles.		Specific gravity.
12	equal to	.400
14	"	.425
16	"	.450
18	"	.475
20	"	.500
22	"	.530
24	"	.560
26	"	.600
28	"	.640
30	"	.670
32	"	.700
34	"	.730
36	"	.770

For further details on the experiments on coal gas and the mode of analysing, the reader is referred to the "Analysis of Gas," for practical men, by A. Wright.—*Hughes on Gas.*

The Suez Canal.

A letter by the Duke of St. Alban's in the London *Times* takes a favorable view of the prospects of the Suez Canal. The Duke says, in reference to the great or salt water canal, to which the smaller or fresh-water canal is merely subsidiary: "The first point of interest after leaving Suez is Great Shalouf. This is the most important cutting next to El Guisr. It is four miles in length, through clay, stone, and sand, and is dry at present. Three thousand European and Arab workmen are kept here. I was more struck here than anywhere else on the works. The canal is cut to its extreme depth, and the water will stand 26 feet deep at low water in the Red Sea. You look down into this enormous dry channel, with its busy hive of workmen scooping away the ground and filling the trucks which stationary engines draw up and replace with others; and while looking on this magnificent work you almost persuade yourself to believe in large steamers passing to and fro here between the West and East, in the coffers of the company being filled with their dues, and in delighted shareholders drawing large dividends. At the Serapium, some distance further inland, you come on another piece of the canal finished, and it is here you meet the waters of the Mediterranean, which have been brought over half of the whole distance in the Maritime Canal, and are kept back from the other portion of the works by an embankment of earth."—*London Builder.*

A NEW FLYING MACHINE.—In St. Louis, an æronaut is making a new flying machine. It is twenty-eight feet in height with an expansion of twenty-two feet, and the full weight of the machine is two hundred and eighty-five pounds. When ready for aerial navigation it will be capable of carrying with ease one hundred and fifty pounds. The principle is new, and the invention claims the compression of hot and cold air in running a caloric engine, which is attached to the back. The body is enclosed in a complete set of mail armor, made of vulcanized india-rubber and brass, with glass in front, which protects the body and face from the wind. Attached to the engine, and connected by means of a tube passing over the shoulder, is a large cylinder, containing the compressed air, which is worked with each hand. By this means the navigator can go up or down with ease, and regulate the engine at his own leisure. Attached to the feet, head and cylinder are doubled, inflated wings, four feet in length; and by means of cord and india-rubber valves attached to the fly-wheels of the engine, are two large inflated wings, on the compressed air principle, eighteen feet in length, and which turn with lightning speed in a circular revolution, bearing up the entire machine. Immediately above the engine is attached, by means of cords, a large double inflated parachute, measuring sixty-six feet in circumference, with a tube connecting from the center with the caloric engine.

Burning Fluids—Probable Action of the Insurance Companies.

A large number of persons assembled at 152 Broadway, on the 27th ult., to witness experiments with several illuminating fluids now sold.

The Insurance Companies represented were the Germania, Fulton, Williamsburgh City, Kings County, and Niagara. A Mr. McLean presented a sample of his "liquid gas," and enlarged upon its non-explosive nature, its superior brilliancy, etc.

Messrs. John Mitchell, of the firm of Donnell & Co., of the Laurel Hill Oil Works; George Shepherd, of Silver Springs Oil Works, and a Mr. Simons, all experts in the oil business, were present. Mr. Mitchell freely expressed his opinion of various illuminating preparations now sold, representing that they are of a most explosive and dangerous character. Mr. George Shepherd brought the matter to a practical test by placing some liquid gas in several saucers arranged in a ring sufficiently contiguous, and then applying a light to one of them. No sooner was the light applied than all were ignited simultaneously, as gunpowder would be under like circumstances.

A saucer of pure kerosene was then placed in the midst of a circle of saucers filled with liquid gas, and though the fluid was fired instantly, the kerosene was not affected. The fluid caught fire from a match the distance of from two to three inches. It was stated that within the past year forty-seven deaths have resulted from the use of dangerous illuminating fluids.

The result of the meeting is that the insurance companies have taken the matter into consideration, and will probably come to the determination not to insure places where such fluids are sold or used.

We understand the subject will come up before the Board of Underwriters of this city.

Report of Committee on Chemical Products.

The following Report was delivered to the Institute of Technology, at the meeting of the Society of Arts, held April 16, 1868, and was published among the proceedings in the Boston *Transcript*, April 22:

Mr. Frederick F. Stimpson, Secretary of the "Committee on Chemical Products and Processes," made the following report in behalf of that committee, on the subject of the "difference between the volatile hydrocarbons known in this market as gasolene, benzine and naphtha; and wherein danger is to be apprehended in the use of these liquids for illuminating purposes:"

This committee would respectfully report that after careful examination they find that the term naphtha is a general term, and covers both the other terms. The word naphtha is one of great antiquity; it has long been applied to certain springs in Persia from which is obtained a volatile, limpid, bituminous liquid, having a strong, peculiar odor, and generally a light yellow color.

When the art of distilling coal tar became known the same term was applied to the more volatile products of such distillation; the heavy products being called dead oil and asphaltum. The term was next applied to the most volatile products from the distillation of coal for oil. When petroleum took the place of coal for this purpose, the term naphtha was again used to distinguish the more volatile, so-called "light" products from the heavier ones. This is still its use, and in our market all volatile products of petroleum lighter than illuminating oil (or what is known among our dealers as "kerosene," which has a specific gravity of 8·10 or 45 degrees by Beaume's Hydrometer), are designated by the general name of naphtha.

Of the naphthas those of a gravity from 45 deg. to 80 deg. Beaume are often, though improperly, called benzene or benzole. True benzole is a production of coal tar, and differs essentially from any liquid obtained from petroleum. The term "gasoline" is applied to all naphthas having a specific gravity lighter than about 80 deg. Beaume, the lightest known being about 90 degrees.

This committee find, however, by reference to Prof. C. M. Warren's unpublished determinations, that none of these products are simple bodies. All of them are mixtures, in indefinite proportions, of at least twelve hydrocarbons, distinguished from each other by their boiling points, which vary from 32 to 318 deg. Fahr., and are nearly as follows: 32, 47, 86, 99, 142, 156, 195, 208, 247, 261, 303 and 318 deg.

While gasoline contains mostly those hydrocarbons whose boiling points are low, kerosene is composed chiefly of those whose boiling points are comparatively high. The isolation of any one of these products being a matter of great difficulty, few have attempted it, and your committee have had to rely on the labors of a fellow member for much valuable information on the subject. To completely separate the constituents of any sample would be the labor of many months.

Your committee also report that there is great danger from the careless use of naphtha—first, on account of its great inflammability, and second, from the liability of forming explosive mixtures of the air and vapors. The liquids are not in themselves explosive, neither are the vapors; but both are highly inflammable. If the liquids escape by any means and form pools, or saturate porous substances, the near approach of flame may cause the vapor to ignite and set fire to the whole exposed surface of the liquid.

The vapors, it is true, are not explosive, but they become so when mixed with air in certain proportions, and this committee would particularly call the attention of the society to the fact that such mixtures are more likely to be formed in what are called empty cans, which have contained hydrocarbons, and from their supposed emptiness are imagined by ignorant people to be free from danger. A light may be applied with but little or no danger to a vessel full of gasoline or gasoline vapor, or even such a mixture of vapor and air as would produce lighting gas; but in case the vapor be mixed with a sufficient quantity of air, it would instantly explode.

(Signed) JOHN M. ORDWAY, Chairman.
FREDERIC E. STIMPSTON,
Secretary of Committee.

The Mont Cenis Tunnel.

This remarkable work makes steady progress. Of the total length, 12,220 *mètres*, 8,049 *mètres* are completed. The following is the advancement and expenditure for each year since the commencement of this undertaking to the end of 1857. The expenditure for 1867 has not yet been published:

Length of Tunnel completed.

Date.	Total during year.	Total length.	Amount.
	Mètres.	Mètres.	Francs.
1857 } 1858 }	497·60	497·60	3,369,246
1859	369·10	866 70	1.630,753
1860	343 30	1,210·00	2.500,000
1861	363·00	1,573·00	3,000,000
1862	623·00	2,196·00	2,000,000
1863	802·00	2,998·00	3.500,.00
1864	1,088 00	4,086·00	6,552 254
1865	1,223·70	5,309·70	5,502,738
1866	1,024·99	6,334·69	5,644,982
1867	1,511·96	7,846·65	—

The probable cost of the work was estimated at 70,000,000 francs (2,800,000*l.*); of this amount 33,699,973 francs were expended to the end of 1866, justifying the estimate very remarkably.—*Builder.*

Dr. Bowditch's System of Purification.

Great difficulty has been experienced for some years to find an economical and effective means of removing the bisulphide of carbon from gas; and there can be no doubt that this impurity has been increased through the high heats and protracted distillation often adopted in the use of clay retorts, giving rise to many serious complaints on the part of the public.

The process adopted by the Rev. Dr. Bowditch, of Wakefield, is very ingenious. By this, the gas is caused to pass through a layer of hydrate of lime, heated to between 300° and 400° Fahr., when the bisulphide of carbon is decomposed and resolved into carbonic acid and sulphuretted hydrogen, which are removed with facility by the ordinary means of purification. This system has been adopted at several provincial works, and Dr. Frankland's opinion of it is highly satisfactory; that gentleman has stated, that gas so purified does not contain more than two or three grains of sulphur in the one hundred feet of gas. But, according to other good authority, the process is injurious to the illuminating power of the gas, on account of the hydrocarbons being deposed.

Report speaks highly of a method for removing the bisulphide of carbon, adopted by Mr. Lehigh, chemist of the Manchester Gas Company. The process is not yet made public, but shortly a description of it may be anticipated, and should it be equal to expectations, will be alike beneficial to gas companies and the public.—*Hughes on Gas Works.*

Correspondence.

The Proposed Convention.

PHILADELPHIA, April 25th 1868.

M. L. Callender & Co.:

Respected Friends: We believe good results would arise from your proposed Convention, as an interchange of views are always beneficial. Philadelphia being a central point, north and south, perhaps it would be as convenient as any. Respectfully,

R. D. WOOD & Co.

PHILADELPHIA, PA., May 2, 1868.

M. L. CALLENDER & Co.

Gentlemen: Referring to the Convention of Gas Engineers, etc., we heartily approve of it, as suggested in your issue of the 16th ult., in which not only gas engineers and superintendents will take part, but all parties interested in the manufacture of the various apparatus and materials used by gas companies. We think much valuable information will be gained by an interchange of opinions of all parties interested. As to the place of meeting, we think it should be as central as possible.

Set us down for one copy of Mr. Smedberg's "Synopsis of Gas Lighting." Very truly yours,

HARRIS & BRO.

Smedberg's "Synopsis of Gaslighting."

JACKSON, MISS., April 13th, 1868.

James R. Smedberg, Esq:

Dear Sir: Please to place my name upon your list of subscribers to your "Synopsis of Gas Lighting" from the London Journal.

Your articles on the "Practical Management of Gas Works" testify to your ability for the undertaking of such a work. Respectfully yoors,

DOUGLAS WARD,
Superintendent Jackson Gas Co.

JOHNSTOWN, April 6th, 1868.

Mr. James R. Smedberg:

Dear Sir: Please put my name on the list of subscribers for one copy of the proposed "Synopsis of British Gas Lighting." I would also add that I hope the proposed Convention will be held at an early day.

Respectfully yours,

R. RANDOLPH,
Sup't Johnstown Gas Co., Pa.

LYNN, April 29, 1868.

Messrs. Editors: We are in favour of holding a Convention of gas manufacturers. Our company will be represented by one or more of our members, if it is holden after the 15th of June, 1868.

You may place my name on your list of subscribers for the "Synopsis of British Gas-Lighting." I have long felt the need of such a work for reference.

Yours truly, A. MACE,
Agent Lynn Gas-Works.

The following additional subscriptions have been received, making 189 in all.

Waterford Gas Light Co.
R. Randolph, Sup't Johnstown Gas Co.
Douglas Ward, Jackson Gas Co, Miss.
A. Mace, Agent Lynn (Mass.) Gas-Works.
Patrick McClory, People's Gas Works, Chicago, Ill.
Harris & Brother, Philadelphia, Pa.

—Pumps for the San Francisco Dry Dock Company have just been completed. They are the largest ever made in this country, weighing 75 tons each, and will raise more than 16,000 tons of water in two hours.

—M. W. Brown, of West Farms, N. Y., has a recent patent for steeping paper in a mixture composed of 100 parts of glycerin and 10 parts of saluratus. The paper is used for wrapping tobacco, snuff, etc.

—There is now good reason to believe that before the summer of 1869, a continuous connected line of telegraphs will be established between England and her Indian possessions.

A New Apparatus for Burning Crude Petroleum.

Mr. J. White, of San Francisco, has patented a new apparatus, having the same end in view as Col. Foote's invention, but differing in principle and construction. The San Francisco *Times* of a recent date contains the following in relation thereto: "In Colonel Foote's apparatus the flame is produced by a combination of vaporized petroleum, superheated steam and atmospheric air. Mr. White dispenses with the atmospheric air altogether, claiming that its admixture with the other gases does not improve the flame, but, on the contrary, deadens it. Our own observation of the effect produced in Colonel Foote's apparatus, by introducing the common air, does not warrant us in accepting, without doubt, this statement, as in the experiments which we witnessed, the flame was certainly enlivened and rendered fiercer by the triple admixture. The general application of the principle in Mr. White's apparatus is much the same as the one already noticed by us. In starting the fire a handful of kindling wood is used to heat a cylinder which has a small pipe running through the center. Into this pipe the crude petroleum is admitted when sufficient heat has been obtained, and draining out through two small holes, one-twentieth part of an inch in diameter, vaporizes, and forcing its way through a rose-shaped burner underneath, ignites and burns freely. In a short time the steam, which is brought from the steam-chest, and passed through a U-shaped pipe, becomes superheated, when it is admitted to the retort, and mingling with the vaporized petroleum, issues from jets placed on the upper as well as the lower side of the retort, and produces the perfect intense flame. It was at first supposed that White's apparatus would consume about two gallons of crude petroleum, at 12½ cents a gallon, every hour. The result of the experiments, however, proves that only one half of this quantity is necessary, thus settling the question of economy beyond dispute.'

Nitro-Glycerine—Its Composition.

The greater portion of animal fat is composed of several proximate principles combined in indefinite proportions, these principles act in chemical relations like compounds of the same substance, glycerine, with a fatty acid peculiar to each. In a fatty substance, such as butter, we find peculiar fatty matter which may be considered as compounds of glycerine with volatile acids. The most simple method to prepare glycerine consists in treating heated fat with the oxide of lead, in presence of water; an insoluble soap of lead is formed and the glycerine remains dissolved in the water. The aqueous solution is subjected to a current of sulfhydric gas produced by treating the metallic sulphides with dilute sulphuric acid, the reaction is as fellows: Fe S + So_3 + Ho—Feo So_3 + HS.—; this precipitates a quantity of the oxide of lead dissolved in the state of a sulphide, after which it is purified at a gentle heat, and evaporation completed in a vacuo. Glycerine is a syrupy colorless liquid, tasting somewhat like sugar, from which circumstance it derived its name, is insoluble in water, but soluble in all proportions of alcohol and ether. It is decomposed by heat, yielding very complex products, among which worthy of note is an oily, colorless, disagreeable-smelling liquid called acrolein, and has a formula of C_4 H_6 O_2. An oxidizing substance, such as nitric acid, forms with glycerine, oxalic acid, and by mixing three parts of nitric acid with one part of glycerine, union ensues with an elevation of temperature and an acid compound, nitro-glycerine acid, is produced. It is now believed the great explosive force of nitro-glycerine is due to the sudden conversion of the liquid into gases, principally nitrogen and carbonic acid, it being enclosed, and the carbon not obtaining any oxygen from the air combines with the oxygen of the compound and produces carbonic oxide or carbonic acid whereby a great amount of heat is developed and expands the gases to a great extent. The result will vary according to the composition.—*Portage Lake Gazette.*

—The medals and diplomas awarded to American exhibitors at the Paris Exposition recently arrived in Washington. The collection consists of 4 crosses of the Legion of Honor, 3 grand prizes, 15 gold medals, 1 artist's medal, 74 silver medals, 95 bronze medals, and 300 diplomas.

PATENT CLAIMS.

Pertaining to Gas, Water, etc.

75,960.—Lamp Burner.—Geo. Neilson, Boston, Mass.

I claim, 1. The combination, in a burner such as described, of the air-supply cylinder, with a deflector hinged to said cylinder, substantially as and for the purpose herein shown and set forth.

2. The combination, with the chimney-rest and wick-tube, of an air-supply cylinder, detachable or removable from its seat, and a deflector hinged to the air-supply cylinder, substantially as and for the purposes herein shown and set forth.

3. The combination, in a burner such as described, of a chimney rest, air-supply cylinder, and deflector, when the said parts are capable of being removed from and adjusted to the burner bodily and together, substantially as and for the purpose herein shown and specified.

75,819.—Pump.—Stillman White, assignor to himself and Christopher Dexter, East Providence, R. I.

I claim a pumping-apparatus, consisting of a central force-pump and two or more lift or suction pumps, the area of the first being quite equal to the area of both or all the others, and so arranged that power applied to the main or central piston-rod is communicated by means of a cross-head to both or all the other piston-rods so that the power of forcing the main or central piston downward is fully compensated or balanced in its ascent, substantially as shown and described.

76,319—Lamp Extinguisher.—Joseph W. Fowle, Boston, Mass., assignor to William Carlton, Rufus W. Merril, and Charles E. Abbot.

I claim a lamp extinguisher, consisting of inclined sides, which, when brought into contact, form a close chamber over the mouth of the wick-tube, substantially in the manner described.

76,321—Gas Cooking Apparatus.—Michael Germann, Cincinnati, Ohio.

I claim, as an article of manufacture, the gas cooking apparatus as described, consisting of an iron bracket, pot stand and gas burner combined, substantially as and for the purposes set forth.

76,338—Process for Making Gas.—James McGeary Salem, Mass.

I claim, 1. The use of partially-spent coal in one retort to quicken and intensify the heat in another retort or chamber alternately, as set forth.

2. The use of partially-spent coal for decomposing superheated steam, substantially as set forth.

3. The use of superheated steam, produced as described, as and for the purpose set forth.

76,360—Drop-Light for Chandelier.—William C. Vosburgh, Brooklyn, N. Y.

I claim, 1 The case B, having the longitudinal slot and notches I I, to catch and retain the pin N, so that the drop-light may be retained at any desired height.

2. The case B, made as described, in combination with the flexible tube C, pulley P, and weighted disk D, substantially as and the purpose herein set forth and described.

76,904.—Hydraulic Mains for Gas Works—James R. Floyd and Joseph A. Sabbaton, New York city, assignor to James R. Floyd.

We claim the combination of the main pipe (constructed with a lateral opening) with a lateral port plate (formed separately and applied to the lateral opening of the main pipe), substantially as before set forth.

Also, the combination of the said main pipe, lateral port plate (formed separately and applied to the lateral opening of the main pipe), and dip nozzles for the ports in the lateral port plate, substantially as before set forth.

76,907.—Dry Gas Meter.—William Wallace Goodwin, Camden, N. J. Antedated November 5, 1867.

I claim the application, to a dry gas meter, of a device or combination of devices whereby the orifice in the plate through which the current of gas passes to or from the valves, will be either entirely closed or fully opened thereby, in accordance with the relative positions of the meter between the supply and discharge pipes as described, the said device or combination of devices being constructed and operated in the manner herein described, or in any manner that will produce the same effect.

76,929.—Condenser.—William A. Lighthall, N. Y. City.

I claim arranging the exhaust pipe from the engine, with its series of openings, as shown, in relation to the vacant space between the series of tubes, as and for the purpose herein set forth.

76,974.—Purifying Oil and Fat.—Richard C. Barton, Brooklyn, N. Y.

I claim, 1st. Purifying fat and oils, and decomposing them, to separate them from imparities and from gelatinous matter, by means of ferment or protein, as set forth.

2d. The process herein shown and described of treating oils and fats for purification, and for separating impurities.

3d. The process herein shown and described of treating stearic acids.

4th. The apparatus herein shown and described, consisting of the tank A and B, and of the agitator C, all made as set forth, for the purpose of treating oils and fats in the manner specified.

77,027.—Hydrant.—Benj. G. Fuller, Baltimore, Md.

I claim the combination with the air chamber and the piston cylinder of the hydrant, of the valve and herein described valve mechanism, operated by but not attached to the piston head, and held within a tube or case, constructed and connected with the said air and piston cylinders and chambers, in the manner and for the purposes shown and specified.

77,124.—Apparatus for Burning Hydrocarbon.—F. T. Suhr, Titusville, Pa. Antedated April 7, 1868.

I claim, 1st. The cap or cover C, together with the inside partitions m m, and the reducer P, for the purpose of confining and directing the currents of air upon the flame before they can pass out of the opening at the top.

2d. The combination of the frame, draft-pan, oil dish, and covers, as above described, all so placed, air-tight, in the fire box or chamber, that no air can pass into the said fire box, except such as passes through the draft-pan aforesaid, for the purpose of producing heat from crude petroleum or other combustible materials.

77,156.—Apparatus for Carbonizing Gas.—William H. Laubach, Philadelphia, Pa.

I claim the hollow glass gage tube C, caps f f, straps, d d, set screw e, and tubes g g, in combination, made in the manner and for the purpose described.

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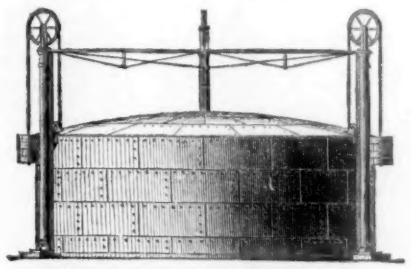

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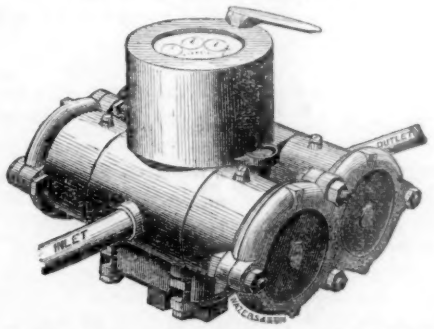

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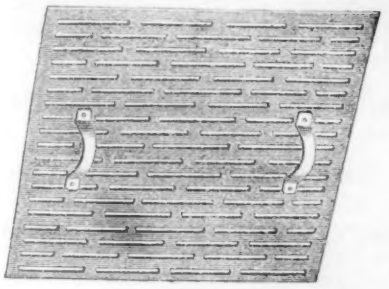

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EDITORS AND PROPRIETORS.

SATURDAY, MAY 2, 1868.

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Answers to Correspondents.

R. L., OF BROOKLYN, N. Y.—Gas, on escaping, being lighter than air, at once takes its place next the ceiling; the law of diffusion of the gases begins to operate, and in a given time, in proportion to the extent of the escape, about one foot of space from the ceiling will be filled with the most explosive mixtures, while the under part of the room has scarcely any gas in it. Where an escape of gas occurs, enter the room without a light, open the top of the window and the door, and before introducing a light, take means to ascertain, as by smelling along the ceiling, that the gas is all gone. If a light is in the apartment, extinguish it or lower it to the floor; to lift it near the ceiling is highly dangerous.

C. L., OF SAN FRANCISCO.—Accidents have sometimes occurred from the use of water slide pendants, when the seal has not been sufficient, or from the evaporation of the water. To prevent evaporation, a teaspoonful of good salad oil should be added after the hydraulic tube has been filled up with water.

E. N. H., OF NEW YORK.—Sparks in gas flame may be produced by the ignition of matter floating in the air, or, according to some authorities, by the presence of naphthaline in the gas.

A. W., OF ST. LOUIS.—For cleaning out argand and other perforated burners, a strong darning needle is the best instrument, and for slit burners, a piece of thin watch spring, or a slip of writing paper.

S. A. P., OF CHICAGO.—The proportion of light given by sperm and wax candles is 14 sperm — 16 wax; though stated as each burning 120 grains per hour, it is found in practice that sperm candles burn 132 grains, and wax candles 172 grains per hour. A sperm candle ·85 of an inch in diameter consumes one inch in length in an hour.

WATER AS A SOURCE OF HEAT, LIGHT AND MOTION.

Chemically, water is a protoxyd of hydrogen, and its chemical symbol is H O. Hydrogen combines with two proportions of oxygen also H O to form the peroxyd or binoxyd. Some authorities assert there is a third compound—the sub-oxyd of hydrogen—formed by the gradual absorption of hydrogen by water.

The binoxyd is an artificial preparation; water being the only natural combination.

Few realize that this apparently simple element is the most important and, at the same time, the most remarkable of all chemical compounds. Existing as the ocean in a separate condition, it is the most abundant substance upon the face of the earth, and covers to an unknown depth two-thirds of its surface; while seas, lakes, and rivers measurably increase the estimate. Water also enters largely into the composition of nearly all organized matter, and in all animated nature it is an essential element. Even man is by weight three-quarters water.

Composition of Water.—Water, as before stated, is formed by the union of two volumes of hydrogen and one of oxygen; by weight one part of the first and eight parts of the latter. Proof of this, both by analysis and synthesis, forms the basis of a great variety of interesting experiments. By analysis, by decomposing water by the galvanic current, wherein the elements are both separated and obtained in a pure state—one measure of oxygen and two measures of hydrogen. By combustion, the synthetical union of these gases may be obtained again, in just this proportion by volume, by the action of spongy platinum, or by the electric spark, and the product will be of course—water.

Water may be decomposed and hydrogen obtained by passing its vapor over any metal at a red heat, that will absorb the oxygen to form an oxyd, and leave the hydrogen free. Iron, zinc, and other metals have this property; charcoal, coke, and anthracite will have the effect to decompose steam at a high heat—the oxygen uniting with the carbon to form carbonic oxyd and free hydrogen. Specific methods of superheating and decomposing steam upon this latter principle have been patented both in this country and in Europe, whereby a gas for heating and illuminating purposes has been obtained at a very low cost. We understand it may be obtained at a cost of less than 25 cents per 1000 cubic feet, as a continuous process, requiring little labor or skill.

Gaseous Fuel.—Taking this as a basis, as to cost, in consideration that the combustion of hydrogen produces a heat second only to that produced by electrical agency; and that the proper combustion of gaseous fuel yields the full equivalent or unit of heat, while coal, when consumed in the best constructed furnaces, only gives from 15 to 25 per cent. of the equivalent or unit of heat due to its combustion—a loss of 75 per cent. Other considerations may be taken into account, such as the facility with which it may be employed, comfort, cleanliness, and general utility in its use compared with coal.

It is only necessary to have the pipes laid similar to ordinary gas pipes to conduct the heating gas into all our dwellings and elsewhere, wherever heat is required for any purpose; the apparatus to burn the gas (the burner) being quite simple, the principal object being to have complete combustion and radiation, and to dispose of the products of combustion in a proper manner, which is fully accomplished by late inventions in stoves, heaters, ranges, etc., for this purpose.

Such apparatus is being employed quite extensively of late, to utilize illuminating or coal-gas for fuel, and even at its present price many use it preferably to coal. How much greater, then, must be the advantage of a gas especially adapted to developing heat, and at comparatively such a reduced cost. It is the proper fuel for the reduction of ores, smelting of iron, etc., as it is entirely free from sulphur and other impurities. In fact, it is a question if all our industrial arts, where heat is employed, cannot use hydrogen to wonderful advantage in preference to solid fuel.

From these facts, it may well be supposed that gaseous fuel is likely to take an important position as an element of political and domestic economy, and whoever will first place the use of hydrogen gas in a practical form before the public, that is, on the same basis as illuminating gas, so that it may be similarly distributed and as easily employed, and its great advantages realized, will unquestionably not only immortalize themselves throughout the scientific world and become famous as great public benefactors, but reap a financial harvest beyond all computation.

Hydrogen as an Illuminator.—Hydrogen may be employed to produce light in two ways. If a lighted jet of hydrogen is projected in combination with a jet of oxygen upon a piece of lime or magnesia, an artificial light is produced of great brilliancy, unequalled by any artificial light except the electric light. This is known as the "Oxyhydrogen Light," the "Drummond Light," and sometimes the "Lime Light." It is too powerful for ordinary use, and is generally employed for phantasmagoria, dissolving views, the solar microscope, theatrical illumination, and experiments in optics, and for illuminating skating-rinks, mass meetings, etc. It is also recommended for lighthouses and signal-lights.

This light is white, and resembles the sun in its effect upon colors, the various shades and tints of pictures or dress are plainly discernible as by the diffused light of day.

Late experiments we have seen go to show that a lately patented improvement in this light will so simplify and cheapen it, as to make it generally practical as an illuminator. It consists in making the incandescent material indestructible and capable of absorbing sufficient oxygen from the atmosphere to fully consume the hydrogen. It is called the "Calcio-Magnesium Light."

Hydrogen may also be rendered illuminating by converting it into carburetted hydrogen by passing it into a retort where rich gas coals or other carbons are in process of distillation. This forms the basis of an important improvement in ordinary gas manufacture, whereby the steam is first decomposed by anthracite coal, and the resultant gases, at a very high temperature, are passed into and through the ordinary retorts, when coal-gas is being distilled, immediately after charging. This brings up the heats of the newly charged retorts immediately to the point of destructive distillation, and prevents the formation of condensible hydrocarbons, which otherwise would go to form coal-tar in the hydraulic main. The highly heated gases also seize upon the volatile vapors as fast as they disengage and, enter into combination thereby forming a largely increased volume of permanent gas—carburetted hydrogen.

Carburetting it also, by passing it through or over the various hydrocarbons at ordinary temperature, or mixing it with the vapors of their distillation at high temperature, will convert it into an illuminating gas, on the same principle that air is employed in Rand's pneumatic process. It is a question if this principle is not destined to be of great importance as a simple and cheap method to produce a permanent gas. The petroleum products of our oil regions are so abundant and cheap, and likely to continue so, that any method that will convert

them into a permanent gas, that shall be safe and unobjectionable on a small as well as large scale, and avoid the necessity of dangerous lamps, will be hailed with satisfaction by the public, and by insurance companies in particular.

Hydrogen as a Motor.—The use of coal-gas to give motion to machinery, as a substitute for steam, has been employed some years in a small way in Europe, and somewhat here, as instance the Lenoir gas engine, the Hugon engine, and several others. The operation consists in exploding a proper mixture of air and gas alternately, in either end of a cylinder to give impulse to the piston by its great expansive power. It is certainly a far more simple motor than steam, as it dispenses with the boiler, and is consequently safe, and the apparatus less expensive; while its far greater convenience will be readily understood.

How much better, then, must be a gas like hydrogen, devoid of carbon, which, as in coal-gas, tends in time to clog the valves and obstruct the action of the piston. Hydrogen, besides its less cost, will unite with a larger volume of air to make the best explosive mixture The carbon in coal-gas is really of no advantage whatever, but a positive detriment. Hence, the poorer it is as an illuminator—the less candle-power—the better will it be for a motor.

THE CONVENTION OF GAS ENGINEERS, ETC.

We have been requested by a large number of correspondents to set a day for the Convention of Gas Engineers, Etc., to be held in Cincinnati, Ohio. The majority, so far, are desirous to have it take place in the latter part of June, and we accordingly name the 23d day of June next.

The precise place and hour of meeting, and other information, will be definitely given in the next number of this Journal All those who intend to be present at the Convention at that time, will please inform us by mail at once, so some idea may be formed what arrangements will have to be made for their accomodation.

The objects of the Convention have been fully discussed, and do not require repetition at this time.

INCIDENTAL ITEMS.

By reference to a late circular of Messrs. R. D. Wood & Co., Philadelphia, Pa., we learn they have, by extension and purchase, been largely increasing their capacity for the production of cast iron gas and water pipe. The list of places where they have supplied materials is extensive, embracing almost every quarter of the Union from Maine to California. This speaks well for them, and is interesting as showing the great and growing demand there is for the two great staple necessities of life—gas and water—which are by the use of these modern conveniences made luxuries.

Prof. P. H. Vanderweyde, of this city, has invented an apparatus to produce artificial ice rapidly and economically, by the use of the very volatile distillates of petroleum. The volatile material is condensed into a fluid in proper vessels by pressure, giving out its latent heat to running water. When the pressure is removed it evaporizes rapidly, producing intense cold, which converts water surrounding the vessels into solid ice in a few moments. A domestic ice machine may soon be a *sine qua non* of every household. Pocket refrigerators may be just the thing in the "dog-days," when Newport and Saratoga are geographically so near, and yet pecuniarily so far.

In another column will be found the advertisement of Mr. Thomas F. Rowland, proprietor of the Continental Iron Works, of Greenpoint, N. Y. These extensive works, during the war, turned out some of the best and largest "iron-clads" our Navy Department has ever had constructed—the *Puritan* and *Monodnac* are of this class—superior to any in the world. Mr. Rowland gave ample evidence of his ability to turn out good work with despatch and satisfaction for the government. The facilities of these works for constructing gas-holders of any magnitude and other material and apparatus for gas-works, have induced the proprietor to add that laudable branch of manufacture to the various other manufactures in iron. Gas men and others will be glad to avail themselves of this fact, we have no doubt.

An interesting article appears in this number of the Journal, entitled "Report of Committee on Chemical Products," delivered to the Institute of Technology, at the meeting of the Society of Arts, held April 16th, 1868, at Boston, Mass. The article treats upon the difference between the volatile hydrocarbons known in market as gasoline, benzine and naphtha. The committee acknowledge the valuable assistance and information obtained from Prof. C. M. Warren. No more skilful, scientific and better informed experimenter in this interesting branch of chemical research could have been selected. Mr. Warren may be considered the pioneer in utilizing the various products of coal-tar and petroleum, and making them useful and valuable in various arts and manufactures.

"*The Resources of Missouri,*" a pamphlet of sixty-four pages, has been laid on our table. It was prepared by Professor Waterhouse, of St. Louis, Mo., at the request of the State Board of Immigration. This pamphlet will serve to answer thousands of inquiries on this subject, made from every part of the United States. A general knowledge of the economic advantages of Missouri, will doubtless convert many emigrants from the other States and countries into immigrants and citizens of that State; and with this object in view the pamphlet was published. It contains all desired information on the agriculture, mineral wealth, manufactures, railroads, commercial importance, and educational system of Missouri.

The *Typographic Messenger*, published bi-monthly by James Conners' Sons, the well known type founders of this city, is an excellent magazine of the typographic art, and should be in the hands of every printer. It is beautifully printed on fine paper, and contains everything of interest to the trade. The publishers state that they desire to exchange with every paper in the United States. The publication office is at 28 Centre street, N. Y. Terms, $1 per annum, in advance.

The Williamsport (Pa.) Gas Company are about to enlarge their works to meet the increasing demands. The cost will be about $25,000. A new purifier will be added, a couple of miles of main pipe, and a new tank and gasholder. So we learn through a private letter from their efficient Sec'y, T. Coryell, Esq.

In our issue of April 16th, in the article entitled "Convention of Gas Engineers," we by mistake mentioned Mr. W. W. Goodwin as connected with Messrs. Harris & Co. It should have been Messrs. Harris & Bro., gas meter manufacturers, of Philadelphia, Pa.

We desire to direct the attention of parties having small works needing help to the advertisement, "To Gas Companies."

Messrs. Coe, Wetherill & Co., news agents, of Philadelphia, Pa., formerly Joy, Coe & Co, are still agents for this Journal. The change of firm is the result of the consolidation of the two extensive, enterprising and favorably known houses of Joy, Coe & Co., and Wetherill & Smith.

By referring to the "Patent Claims," it will be seen that James R. Floyd and Joseph A. Sabbaton have patented an important improvement in hydraulic mains for gas-works.

We publish elsewhere a copy of the ordinance which authorized the Cincinnati Gas-Light Co. to supply that city with gas; also the decision of the Supreme Court of Ohio establishing the validity of the contract between the city and the gas company.

T. F. ROWLAND.

Continental Works,

Greenpoint, Brooklyn, N. Y.

Engineer, and Manufacturer of

GAS-HOLDERS

OF ANY MAGNITUDE,

Condensers, Scrubbers, Purifiers, Retorts, Hydraulic Mains, and all other articles connected with the Manufacture and Distribution of Gas, furnished with despatch: Plans and Specifications prepared, and Proposals given for the necessary Plans for Lighting Cities, Towns, Mansions, and Manufactories.

To Gas-Light Companies.

A SITUATION AS SUPERINTENDENT IS wanted by a competent man, whose experience qualifies him to undertake the management or construction of gas-works of any size. Best references to parties in New York and elsewhere. Address SUPERINTENDENT, office Am. Gas Light Journal. 201tf

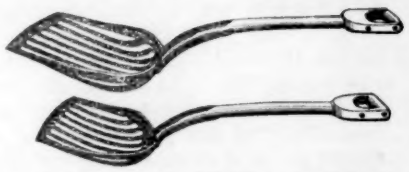
To Gas Companies.

A MANAGER OF SIX YEARS' EXPERIENCE desires a Situation with some Gas Company of moderate size. He is a practical Gas-fitter, and familiar with accounts. Would make gas and take state of Meter, lay or repair street mains, &c., if necessary, for a small works. Address R. Horton, care American Gas-Light Journal. 201-2t

SABBATON'S

PATENT

SCREENING SHOVEL



For Gas Works. Coal Miners and Dealers, Machinists, Steamboats, Locomotives, Stoves. Etc., Etc.

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Saving in Leakage, Saving in Labor, Saving in Lead.

THE MOST PERFECT CONNECTION FOR STREET MAINS.

ROBBINS' PATENT JOINT.

MANUFACTURED BY

GREAT WESTERN PIPE FOUNDRY,

Newport, Ky.,—T. G. Gaylord & Co., Proprietors, Cincinnati, O.

WEST JERSEY FOUNDRY,

Camden Rolling Mill Co., Proprietors.—Jno. W. Middleton, Agent, Phila., Pa.

EXTRACTS FROM TESTIMONIALS.

These pipes can be laid with much greater facility than the common joint, are tighter when laid, and more secure against any disturbance of the joint by action of time or other causes.
In my judgement, the Robbins Joint is superior to any mode yet presented for connecting gas mains. H. J. MILLER, Cincinnati Gas Company.

After using it extensively, and testing it thoroughly, I am fully persuaded that, as a connection for street mains, the "Robbins Joint" has no equal.
Its superiority consists of facility in laying, economy in time and lead, and, above all, its perfection as a Joint, thus saving largely in leakage. H. STACEY, Superintendent Indianapolis Gas Co.

We are entirely satisfied with the "Robbins' Patent Joint" for connecting our street mains. R. SALTER, Superintendent, Covington Gas Company.

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The Manufacturers will contract with Water and Gas Companies to lay the Pipe in the trench, even under water, and guarantee the Joint to be absolutely tight.

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Particular attention given to the charter of vessels at the lowest freights.

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Locomotive Engines,	Cotton Spindles,
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Paraffine Wax and Paraffine Wax Candles. Also the best brands of Burning Oils. All Oils guaranteed to answer the purpose for which they are recommended.
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CAST IRON PIPES AND FITTINGS

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With all the materials used by them. [77-t

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OIL TUBING, CAST IRON DRIVING PIPE,

Boring Tools, Oil Pumps, Sand Pumps, Stuffing Boxes, Tongs, Clamps, Swivels, Joints, &c. 131

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ANALYTICAL CHEMIST,

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SUITABLE FOR GAS MACHINES, ALSO FOR CARBURETTING OF GAS, &c.

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Office & Works in 15th street, Avenue C,

MANUFACTURERS OF

Fire Brick and Tiles,

OF ALL SHAPES & SIZES,

Fire Mortar, Clay and Sand.

☞Articles of every description made to order, at short notice. (135

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☞ *Established in* 1845. ☜

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FIRE MORTAR, CLAY, and SAND.
Articles of every description made to order at the shortest notice.
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Gas Retorts, Tiles and Fire Bricks,

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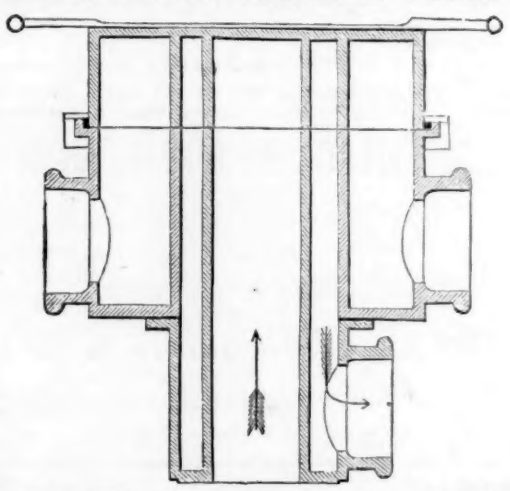

The **American Meter Company** invite the attention of Gas Engineers and Gas Light Companies to the PATENT DRY CENTRE VALVE, which is very superior to the HYDRAULIC CENTRE VALVE, and much more durable, besides being less expensive, and not likely to leak or get out of order. It has been successfully introduced at the following Gas Works, where reference may be had of its satisfactory performance:

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Having the Patterns complete for each size, from four inches to sixteen inches, we are prepared to furnish them at short notice.

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AN INDESTRUCTIBLE COATING FOR

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It consists of seventy-two parts Oxide of Iron, and twenty-eight parts Cement Lime Stone in the one hundred pounds.

It has much more body than red or white lead. It is warranted perfectly water and fire-proof and to withstand a greater heat on metals, without scaling, than any other paint in use.

It is a perfect cover for all kinds of iron, tin, or wood-work, out-houses, and canvas coverings. It prevents and arrests the corrosion of metals, and is not affected by the action of salt, gases, acids or ammonia.

It hardens under water, as has been fully demonstrated by its application to gas-holders, by many of the largest gas companies in the United States; which companies having thoroughly tested its properties as herein claimed, pronounce in its favor over any other paints in the market, even though said at double its price.

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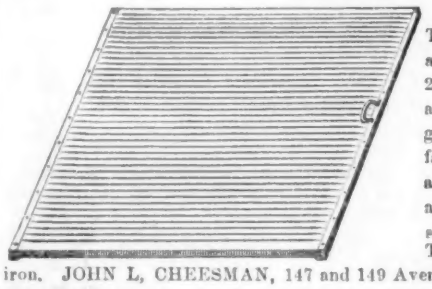

☞ The advantages of these Trays over those made of iron, are economy (they being over 200 per cent cheaper than iron, and will last twice as long), a greatly increased purifying surface, and a saving of time and and labor in removing the lime, as it does not adhere to the smooth surface of the Wood Trays, as is the case with the iron. JOHN L. CHEESMAN, 147 and 149 Avenue C., New York.

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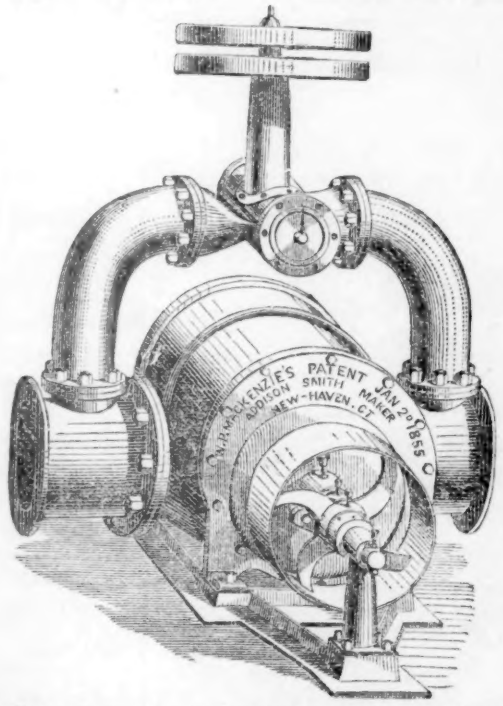

They are made to pass from 4,000 to 150,000 cubic feet of gas per hour; will increase the production and illuminating power of the gas, and add very much to the durability of the retorts, either clay or iron. The Compensator obviates entirely the necessity of water-joints, is compact, durable cleanly, not liable to get out of order, self-acting, quiet, and certain in its operation.

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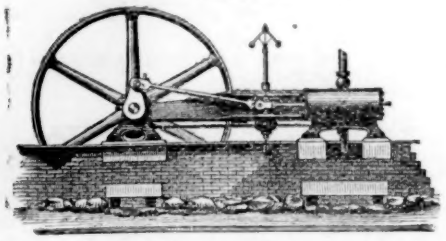

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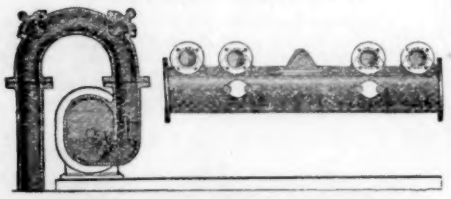

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PATENT LEAD-INCASED TIN PIPE COSTS LESS THAN LEAD PIPE AND IS MUCH STRONGER.

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Recent improvements enable us to supply this pipe at a less price per foot than common lead pipe. To furnish the cost we should know the head or pressure of water and bore of pipe.

Pamphlets sent free. Address the

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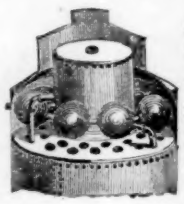
DAVIS' PATENT SAFETY Steam Superheating Boiler,



Requires only 25 lbs. of coal per day to the horse-power. Are made of the VERY BEST IRON, double lapped and double riveted.

Being upright, occupy little space, and are easily cleaned.

Without additional fuel, the Superheater increases the working capacity of the steam 25 per cent., which has been fully demonstrated by the many now in use. (See illustrated circulars).

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IMPORTANT TO GOLD AND SILVER MINERS AND COMPANIES.

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Will furnish at the above address information relating thereto together with experimental packages of

SODIUM AMALGAM

TO PARTIES ENGAGED IN MILLING ORES ONLY.

All preparations and instructions elsewhere obtained are spurious and unreliable.

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MANUFACTURERS OF

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Have on hand a good assortment of articles in their line, of a very superior quality, manufactured by them from the celebrated Fire Clay of Cheltenham, and for sale at reasonable prices and in quantities to suit,

AMONG WHICH ARE

BOILER TILES, Centre and Side of all sizes.

BRIDGE TILES, 6x12, 12x12, 12x18 and 12x24 inches.

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FIRE BRICKS, Square, Arch, Split, Soap, Pressed, Jamb, Wedge, Key, Bull Heads Cut, &c., &c.

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GAS AND BONE RETORTS.

GROUND FIRE CLAY, &c.

Orders left at the office, No. 1007 Levee, between Washington and Carr streets, will receive prompt attention, and goods delivered without delay,

Purchasers can depend upon all articles purchased from us being equal, if not superior, to any other made in the country. (1-1y

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MOORE & GAUSSEN,

Plumbers, Gas and Steam Fitters,

221 West Fifth street, Between Elm and Plum, CINCINNATI, OHIO.

WESTERN AGENTS FOR HARRIS & CO.'S PHILADELPHIA GAS-METERS, &c.

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VALVE WATER METER,

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IS NOW IN USE BY MANY CITY WATER Companies, because of its LOW PRICE, SIMPLICITY, DURABILITY, ACCURACY UNDER ANY PRESSURE, and, (a great advantage,) because it runs with less head than any other meter used.

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GAS STOVES AND HEATERS.

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Fig 5

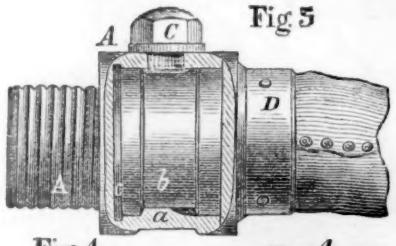


Fig 4

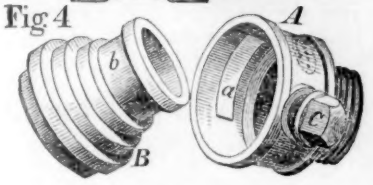
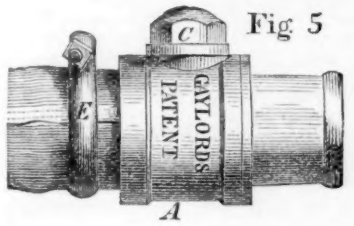


Fig 5



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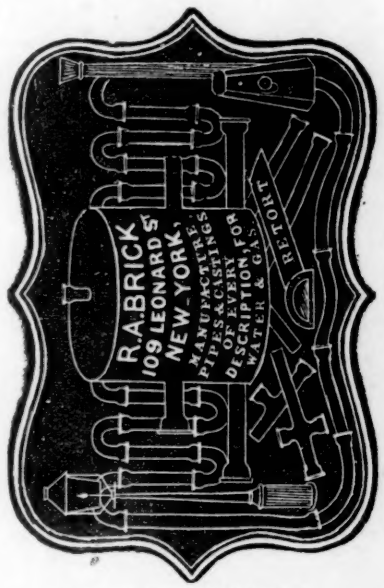

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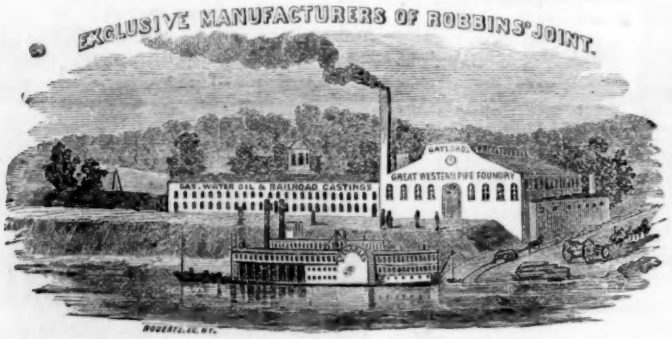

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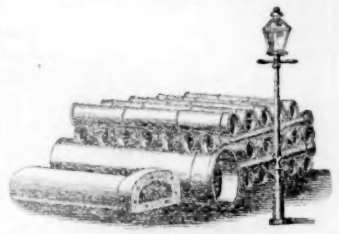

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Harris & Haight's Patent Drill Chuck.

The old fashioned method of securing drills to the spindle, by making the drill shank square to fit a similarly formed socket in the end of the spindle, has been generally superseded at the present day. The more useful and modern way is to have the shanks of the drills and similar tools made round and held in a head or chuck by means of a set screw, key, wedge, or other similar device; or the round shank is made tapering, to fit tightly by the pressure of the work. These later forms are only employed for the largest sized tools and work. Small drills are now made of steel

Fig. 2

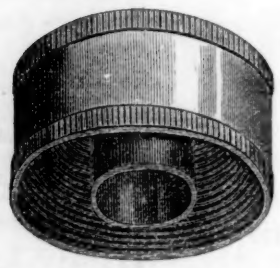


Fig. 3

Fig. 4

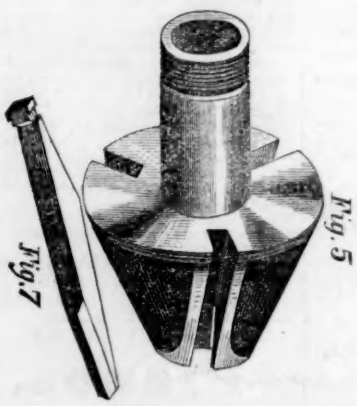


Fig. 5

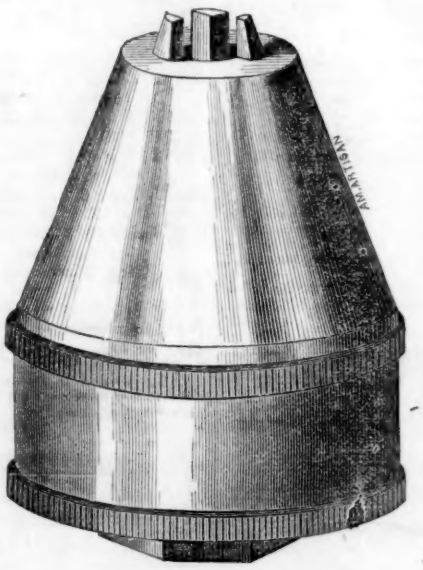
Fig. 6

wire of different sizes, the shanks being of equal diameter as the wire. The beautiful twist drills, now becoming so popular among our best workmen, are so made, and this form necessitated the use of some ready means to secure the different sizes of thedrills in the chuck.

Several forms of chuck have been devised to this end, where the jaws contract concentrically simultaneously, but generally have been found defective in some particular in practice. The accompanying engravings exhibit a late improvement in this kind of chuck which is exceedingly simple and effective, and will commend itself to those who use the lathe.

One of these forms is shown in perspective in fig. 1, and the parts are represented in figs. 2 to 7, as they would be if the chuck was taken in pieces, and the several parts laid down in the order they occupy when put together.

Fig. 5 shows a short spindle with a cone-shaped head, the spindle being designed to attach the chuck to the lathe or drill-spindle; the head is perforated with three equidistant grooves, each one of which has fitted to it a jaw, one of which is seen at fig. 7. Over the cone is fitted the shell, fig. 6, which in contour resembles the cone, and the two are attached by a thread, which are seen at the bore of both cone and shell. As the jaws exactly fill the grooves, they must of a necessity when actuated slide forward until their several interior surfaces impinge upon each other, being so guided by the conical interior of the shell in the parallel formation of the bottom of the groove in which they move. Fitted upon the extension of the cone is the operating ring, fig. 3, which has a screw-thread made upon its interior surface; fitted so as to be received and operated by this thread is the disk, fig. 4. Extending radially upon the side of this disk which is presented to the cone, are three grooves which receive the lips or flanges made upon the ends of the jaws which extend beyond the base of the cone. It is obvious that if the operating ring be rotated, it will cause the disk to travel back and forth in the shell according to the direction of its revolution, and if the ends of the jaws are held to the disk in the manner described, it is evident that they must close upon or recede from any object presented between them at the apex of the cone. A nut, fig. 2, furnished with a left hand thread, screws upon a similar thread made upon the extension of the cone, and confines the ring in place, and also serves to hold the several parts together.



In appearance this chuck is neat and the parts are strongly made; its operation is easy, yet holding drills, wire, screws, or any cylindrical object of less diameter than half an inch, with a strong and powerful gripe.

This chuck was patented June 25th, 1867, by George W. Harris and William H. Haight, of New York city; the chucks are made and sold by the Gaylord Patent Coupling and Manufacturing Company, Nos. 31 and 33 Dey street, New York.

Advertising Index.

☞ In looking for advertisements, see figures 1 to 9, within brackets, at head of advertisement pages.

GAS-BURNERS, APPARATUS, ETC.

Arnold's Metallic Gas Trays—T. G. Arnold, 331 and 336 West 21st street, N. Y. 2
American Meter Company, 512 West 22d street, New York 8
Automatic Gas Purifier—State Rights for sale—Wm. C. Turnbull, care of T. C. Babcock, 50 Broadway, or office of the American Gas-Light Journal 2
Builder of Gas Works, Apparatus, Etc.—P. P. Deily, 39 Laurel street, Philadelphia 2
Gasoleine,—J. W. Wheelock, 284 Pearl st., New York 4
Contractors for Gas-works, Etc.—Murray, Baker & Walker, Fort Wayne, Ind 2
Gas Coals—Bird, Perkins & Job, 104 Wall street, New York 4
Gas Engineers and Contractors—Hoy, Kennedy & Co., 111 Liberty street, New York 4
Gas-Burners—C. Gefrorer, 529 Commerce street, Philadelphia, Pa 9
Gas Meter Manufacturers—Harris & Bro., 1117 Cherry street, Philadelphia, Pa 8
Gas Superintendent—C. M. Cresson, 417 Walnut st., Phil., Pa. 9
Gas Apparatus, &c.—Geo. H. Kitchen & Co., 561 Broadway 9
Gas Burners—Wightman Bros., 25 Kilby st., Boston, Mass. 9
Gas Burners—T. G. Arnold, 224 and 226 West 21st st., N. Y. 9
Gas Burners—W. Anderson, cor Franklin & Elm sts., N. Y. 1
Gas Works for Sale—Colonel J. A. Sabbaton, Manhattan Gas Works, N. Y. 8
Gas Stoves—A. L. Bogart, 792 Broadway 7
Gas Fixtures, Meters, Etc., Etc.,—McHenry & Carson, Cincinnati, Ohio 4
Gas Fixtures & Chandeliers—Alfred Bliss & Co., 95 Bleecker-st., New York 2
Haskins' Gas Stoves—Ford & Murray, 29 East 13th street 8
Plumbers, Gas and Steam Fitters—Moore & Gaussen, 221 West Fifth street, Cincinnati, O. 6
Patent Gas Exhauster—Smith & Sayre, 484 Broadway 5
Purifying Trays—Jno. L Cheeseman, 147 and 149 Ave. C, N.Y. 2
Robbins' Patent Joint for Gas and Water Pipes 4
Solar Gas Machines—Smith & Drake, 726 Broadway 2

FOUNDRIES.

Brooklyn Tube Works—R. T. Benton, Brooklyn 7
Bergen Iron Works—Driving Pipes and Bands—R. A. Brick, 109 Leonard street, N. Y. 7
Columbian Iron Works—Wm. Taylor & Sons, 11, 13 and 15 Adams street, Brooklyn, N. Y 6
Cast Iron Pipes and Fittings—B. S. Benson, 52 East Monument street, Baltimore, Md 4
Continental Works—T. F. Rowland, Greenpoint 3
Dealers in Iron, Copper, Brass, etc.—T. Cassidy & Co., corner of Bridge and John streets, Brooklyn, N. Y 4
Erie Basin Iron Works—Elizabeth, Dwight and Van Dyke sts., South Brooklyn, N. Y 2, 6
Gaylord's Great Western Pipe Foundry—Office 99 and 92 Broadway, Cincinnati, Ohio 8
Louisville Pipe Works—Dennis Long, Cor. 9th and Water-sts., Louisville, Ky 9
Manufacturing Enamelers—Nessle & Taylor, 97 Water street, Brooklyn, N. Y 4
National Foundry and Pipe Works—Wm. Smith, Carroll, Pike, Smallman and Wilkins streets, Pittsburgh, Pa 7
Oregon Iron Foundry—Herring & Floyd, 738, 740, 742 and 744 Greenwich street, New York 6
Pascal Iron Works—Morris, Taskar & Co., Philadelphia, Pa. 9
Southwark Foundry—Merrick & Sons, Fifth and Washington streets, Philadelphia 9
Wrought Iron Pipes, etc.—Joseph Nason & Co., 61 Beekman street, New York 4

WATER METERS, PUMPS, ETC.

Aubin Water Meter—H. Q. Hawley, Albany, N. Y. 6, 9
Babcock & Wilcox's Stationary Steam Engines 8
Davis' Steam Superheating Boiler—Duplex Steam Boiler M'f'g Company, Long Island City, N. Y. 9
Gaylord's Patent Couplings—Gaylord Patent Coupling Co., 31 and 33 Dey street, N. Y. 7
Pat. Lead-Encased Tin Pipes—Colwells, Shaw & Willard, foot of West 27th street, N. Y. 6
Patent Dry Centre Valve—American Meter Company, 512 West 22d street New York 5
Steam Pumps—H. R. Worthington, 61 Beekman st. New York 6
Water Pipes, etc.—S. Fulton & Co. 207 North Water st Phila. 9
Water Closets, etc.—Wm. S. Carr & Co. 149, 151, 153, 155, 157 Centre street, New York 4
Water and Sewerage Pipes—Am. Water and Gas Pipe Company northwest corner of Green and Bay sts., Jersey City, N. J. 5
Worthington's Water Meters—H. R. Worthington, 61 Beekman street, New York 2
Woodward Steam Pump M'f'g Co. 76, 78 Centre st. New York 9

CLAY RETORT WORKS.

Bay State Clay Retort Works, 125, 127 Water st. Boston, Mass. 6
Brooklyn Clay Retort Works, Van Dyke st. Brooklyn, N. Y. 5
Clay Retorts, Tiles, etc.—J. H. Gautier & Co. Jersey City, N. J. 5
Laciede Fire Brick Works, 1007 North Levee, St. Louis, Mo. 6
Mannattan Clay Retort Works, 15th st. near Av. C, New York 5
New York " " 76 Goerck street, New York 5
Philadelphia Fire Brick Works, Vine and 23d sts. Philadelphia 5
Retorts, Pipes, &c.—R. D. Wood & Co., 400 Chestnut street, Philadelphia 9

MINING MACHINERY, ETC.

Broker in Mining Stocks—C. H. Smith 5½ Pine st. New York 4
Industrial Chemistry—Prof. H. Dussance, New Lebanon, N. Y. 2
Mining Engineer—J. H. Tiemann, 240 Pearl st. New York 4
Sodium Amalgam &c.—Prof. Wurtz, 26 Pine st., New York 6
School of Mines, Columbia College, East 49th st. " 2

LAMPS, STOVES, PETROLEUM, ETC.

Chimney Top—C. H. Reichmann, 45 Fulton st. " 7
Lamps—F. H. Lovell & Co 238 Pearl street, New York 7
Paraffine Oil—G. H. Bronson, 132 Maiden Lane New York 4
Street Lamps—J. G. Miner, Morrisania, Westchester Co., N.Y. 2

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Bird Cages—Osborn Manufacturing Company, 109 Bleecker st. 8
Cameron Coal Company—42 Broadway 1
Empire S. S. Line for Savannah, Garrison & Allen, 5 Bowling Green 9
Empire Shuttle Machine—T. J. McArthur, 536 Broadway 9
Empire Sewing Machine Company, 616 Broadway 3
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Finkle & Lyon Sewing Machine Company, 581 Broadway 9
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Plastic Slate Roofing Co. 157 Broadway 7
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Smedberg's "Synopsis of Gas-Lighting" 3
Situation Wanted as Manager of a Gas Work 3
Steam Cooking Apparatus—Bennett, Johnson & Co, 42 Dey st., New York 6
Sabbaton's Patent Screening Shovels—A. T. Smithe, No. 126 Maiden Lane, New York city 3
Situation as Superintendent Wanted—Sup't Office G. L. Jour. 3
Treatise on the Manufacture of Gas—D. Van Nostrand, 192 Broadway, New York 3
Ventilation—Henry A. Gouge. 251 Broadway 6
Watches—T. B. Bynner 189 Broadway 2
Works on the Manufacture of Gas—D. Van Nostrand, 192 Broadway, New York 1